OIL EXTRACTION EQUIPMENT

This invention refers to an oil extraction equipment to be used preferably in low yield costly wells.

From an economic point of view, said wells do not compensate for the usually costly pumping installations despite the fact they are in condition to provide a significant oil flow.

This matter is obviously simple. It consists in making said wells produce with a less costly equipment while providing a flow that turns them to be profitable.

There have been several attempts by means of a long tubular and preferably flexible container having a lower loading open end with a retaining valve and being suspended from a load line by its open top end, so that when said tubular container is introduced into the oil-bearing layer, it is filled up and then lifted at which time said retaining valve is automatically closed and on the surface, it is unloaded within a volute chamber and so on, this method also comprises providing means that may collect the oil stuck on the line and outer surface of the container.

However, as it may be easily noticed, said system, which may be well qualified as rudimentary, does not make it possible to obtain an economically compensating yield for multiple obvious reasons.

It is to be pointed out that there have been certain developments to collect oil from the layers that for certain reasons are formed on the aqueous surfaces by means of certain endless lift-type, with dippers or equivalent ones, but this solution cannot be applied when it is necessary to operate in great depths and within such a narrow tube width as in the present case where, as it may be seen, a guiding system would be

necessary so that at 500 meters or more it enables the correct direction of the lifting element as well as the obtention of the proper flow at the well hole.

Therefore, the main and basic purpose sought by this invention consists in obtaining an equipment that on the basis of an endless lift may be introduced into and operated within a standard piping system of an oil well with the assurance of a perfect lifting element laying so that its portion with the oil load may cleanly go up without grazing the well walls or its lower part, whichever the operation depth is, that is to say for example a 500-meter depth.

The above-mentioned result is intended to be obtained by means of a simple and practical construction arrangement that does not require precision mechanics for its construction and it has a sturdy portable structure wherein all of its components may be completely made with elements of common use in the general mechanics art.

Likewise, this invention comprises obtaining an equipment easy and simple to maintain and that may be performed without the need of great specialization.

SUMMARY

The above-mentioned purposes as well as the ones that will become evident below have been carried out with the equipment being the object of this invention, which characterization is focused on the fact that it comprises a proportionally wide endless band which acts as a conveyor belt having a first section extended between a first outer set of holding rolls that also guides a cellar top end frame, mounted on the top hole of the latter, in order to connect the second and third hanging sections of their respective adjacent rolls which are longitudinally extended together at the same level, by the inner part of the well with free movement with regard to the lining-wall thereof, one of them being up stream and the other one being down stream, and connected with each other by means of a second set of rolls having a lower end head which tautens

them, and which as a diver is deeply submerged in the oil layer, thus providing a counterweight capable of securing the permanent laying of the band along its length, and comprising said second and third sections two sectors out of the well hole, of which at least the corresponding up stream section is operatively related with the means capable of causing the detachment of the oil layer adhered to both faces of the band, said means being connected with corresponding collecting means, including said top cellar end frame, propelling means of the band coupled to at least a motor pulley integrated in said first set of rolls which are connected to said motor pulley by a friction transmission, and both sections of the band are also extended within the well and operatively related with supplementary guiding and retaining means, which are jointly extended at the same level and suspended independently of said sections from said top cellar end frame.

BRIEF DESCRIPTION OF THE DRAWINGS

In order to enable the easy comprehension of this invention and for a better clarity thereof, the equipment being the subject matter of this invention has been illustrated as an example according to one of its preferred embodiments.

Figure 1 shows a general perspective view of the above-mentioned top cellar end frame, which must be mounted on the well hole by means of a corresponding supporting structure settled at the surrounding ground level.

Figure 2 is a scheme top view and longitudinal section L-L of the top end frame or head of the equipment which is mounted at a high level with regard to the well hole, and supported on said supporting structure with the diver frame and band already introduced in the well, together with the guiding and retaining carriers of both sections which the equipment includes within the well as a centralizing train extended between

said sections from the well hole to the diver head, with an annexed sketch as Figure 2' showing the general aspect of said carriers in a top side view.

Figure 3 is a cross-section scheme view T-T of the diver frame that has already been introduced into the well.

Figure 4 is the same view as that of Figure 2' but in a bigger scale.

Figure 5 is a top side view and longitudinal section R-R of the carrier.

Figure 6 is a face view of the same centralizing carrier.

Figure 7 is a cross-section view S-S of said centralizing carrier being schematically illustrated within the well.

Figure 8 is a top scheme view of the equipment head showing another aspect of the general arrangement thereof and of its propelling means.

Figure 9 is a cross-section scheme view M-M of said head showing another aspect of the oil collecting means unloaded by the up stream band section.

Figure 10 is a part scheme view of the top cellar end frame showing an alternative as to the friction transmission arrangement between a double motor pulley and the lifting band with supplementary adjusting means between said pulleys.

In the different figures, the same signs indicate equal or corresponding parts or elements.

DESCRIPTION

In accordance with what has been explained and illustrated, the equipment has been developed on the basis of a continuous extraction concept and for said purpose, it comprises a wide endless band **A**, preferably made in a material such as polypropylene , with a framework that turns the oil adherence easy, which as a conveyor belt, it comprises a first section **I** which is extended at a high level on the well hole, between the supporting rolls which are also the guide of said conveyor belt comprising a first set

b, mounted with free rotation on corresponding axis and supports of a top end frame **B**, which is mounted at a high level over the well hole **P** on a corresponding supporting structure **E**, said set comprising a pair of rolls 1 adjacent to each other and over which said first section **I** is connected with both the second a third long hanging sections **II** and **III** thereof, which are longitudinally extended together towards the interior of the well and spaced out between each other in a parallel way, with a narrow separation between them and with regard to the wall-lining **p** thereof, so that said they may freely move without touching each other or without touching said wall, one of them up stream and the other one down stream, in view of a supplementary arrangement of guiding and retaining means in both sections of the band included within the well and which is referred to below.

Once said sections are within the well and submerged in the oil layer, they connect with each other through a second set of rolls **c** mounted with free rotation in the supporting frame **c'** of a lower end head **C** which as a diver and acting as such, is deeply submerged into the oil layer, thus providing its own counterweight **c''** and hanging below it and duly spaced out from the well lining, but in such a way that it may help with the centralization thereof and exerting a permanent tensile stress on the band so that it causes a steady laying of the band in all its length, including its outer face and consequently secures the separation between said up stream and down stream sections and the band adjustment on said set of rolls that guide it along its whole extension.

Both the second and third section **II-III** comprise two sectors **2** out of the well hole **3**, but within said top head **B** and comprised between said top head and the rolls 1 in respect of which they extend towards the interior thereof, and in operative relation with this sector **2** of the up stream section **III**, there are means **d** capable of causing the detachment of the oil layer adhered to both faces of the band and collecting means **e**

thereof to collect and take to a tank, as illustrated in Figures **2** and **9** as a way of example.

In this embodiment, said top cellar end frame **B** is made on the basis of a casing providing a big collecting tray **e** spread out below said first section **I** and first set of rolls **b** with a hole **4** for the passage towards said sectors **2** of both the first and second sections according to the arrangement illustrated in Figure 2, where the hole is limited in its interior by a ring partition **5** to retain the oil collected in said tray **e** on which a lid **6** with two narrow grooves **6'** for the passage towards the band is adapted, and where one of said grooves has a bigger size in order to let the corresponding up stream section III with its oil load in.

On said lid 6 and with relation to said up stream section **III**, there are the said separating means **d** as flaps **7** which obliquely directed converge over both faces of the band in its same direction so that an adjustment relationship is established to achieve the detachment of the oil layer by friction on both sides of the band there being no limit as to the performance, arrangement and number of flaps, which practically leave both faces of the band completely clean before it gets in contact with the first higher roll **1**, as in the general scheme illustrated in Figure 2.

The above-mentioned first set of rolls **b** further includes a pair of direct suspension rolls **1** of the band, an auxiliary roll **8** that guides one of said rolls and secures the laying of its first section **I** around a motor pulley **9** which is coupled to corresponding means for its propelling by friction transmission between said motor pulley and the band, according to the general scheme arrangement illustrated as a way of example in Figures **2** and **8**, so that the band is moved without slipping and the oil layer lifting adhered to its up stream section is also obtained, and comprised as a way of example by a motoreducer **D** having a speed shifter with which it is necessary to work

in order to ensure a high equipment yield, since the speed must be adapted to the oil density.

Said diver head **C** is comprised by its own frame **c'** having a case shape from which the counterweight **c''** is suspended, said counterweight being provided in order to facilitate its immersion into the oil layer, with the rolls of the second set **c** mounted within said layer and comprised by a pair of main top roll **10** and lower top roll **11** having a concave surface, between which the band guidance is ensured by means of two intermediate auxiliary rolls **12** having a convex surface, so that the band remains extended in a transverse direction thereto when passing from the down stream section to the up stream section thus obtaining the dragging and lifting of a suitably thick oil layer on both of the band faces.

Likewise, said box-shaped frame of the diver head has an elongated quadrangular prismatic configuration with a head **13** having narrow grooves **13'** for the passage of the band so that it may practically penetrate into the case without dragging oil, circulate between its rolls and go out again but now up stream and loading oil.

In this way, the introduction between the rolls of the stones that are usually in the oil and which may block the operation of said rolls is avoided.

In contrast with said head, the case has a bottom 14 with little holes 14' in order to unload the sand the band might drag while passing through the head.

It has been provided to make said case with a big side hole for the roll mounting and a lid screwed to the opposite wall with the respective axis mounted between them.

With regard to the above-comments on the friction transmission between the band and the motor pulley **9**, it should be added that besides trying to embrace a broad area of the motor pulley rim by means of the proper location of rolls 1 and 8, as shown in Figure 2 in order to ensure the band drive without slipping thereon, it has been

provided to supplementary ensure the friction between them by means of a pair of rolls 15 mounted on the end of their respective arms of a support in "V" shape 16, which by means of a stem 17 on its vertex, said support is applied in a frame guide 18, fixed so that rotation around itself is avoided and so that both rolls remain correctly positioned on the band, pressing it by the action of a compression spring 19 against the pulley rim, which offers a suitable convex seat surface while he rolls provide a concave surface.

It is obvious that the scope of this invention is not limited to this adjustment device, which is mentioned as a mere illustrative example since it is not a per se characterization factor of the invention.

With regard to the band, it is to be added that a material with a hydrocarbon high adherence framework must be used, for example a framework comprised by 80% polypropylene and having provided for this example a length that makes it possible to reach a 500-meter-depth.

With regard to the band installation in operative conditions, the following has been established:

The band is fed from a coil mounted with free rotation, but with a certain stopping degree at the hole 3 of the well, on a support of said structure E, with its outer end passing by roll 8 and extended until the motor pulley thus forming the first section I and surrounding it below the rolls 15, it reaches the adjacent roll 1 from which it goes down forming the up stream section **III** which passes between rolls 10- 11- 12 of the diver head in order to finally get out of the latter to form section **II** around the other roll 1 and temporarily anchor the band to said structure.

After this, the diver head **C** with its counterweight **c''** must be arranged within the well hole and by rotating the motor wheel in reverse direction, the progressive unrolling of the band from the coil is obtained together with the gradual entrance of the

diver head into the well taking after it both up stream and down stream sections of the band which will extend along the well at the same time until reaching the desired immersion depth.

Once completed the unrolling of the coil, there appears its inner end that joins the outer end according to any of the arrangements provided by the art to join endless bands with a reduced thickness so that its uniformity is kept, as can be seen in figure 2.

The equipment so comprised according to the basic general outlines is supplemented as previously mentioned with guiding and retaining means in both sections of the band and extended in the same way as said sections along the well and also being suspended over the well hole, of the said structure E supporting the equipment without obstructing the exit of the up stream section loaded with oil or the reentrance of the down stream section for a new extracting run.

Said means have been developed as a centralizing train **F** of both up stream and down stream sections of the band, operating along the whole length of said sections from the well hole to the diver head, and extended between both sections of the lifting band substantially within the medium longitudinal plan of the set, suspended by one top end of said supporting structure and by the other end it is anchored to said head so that it remains at the same level as the band, between both sections, but without exerting any tensile stress over the diver head in order not to limit the band tension.

It consists simply in securing said laying together with said centralizing train with regard to both sections for which it will be enough to apply, if necessary, any of the arrangements provided for by the art, for example a device which compares the tensions between the band and the centralizing train.

Said train is comprised by successive centralizing carriers **f** interconnected in a spaced out basis between each other to the structure and the diver head by means of holding and hitching belt **g** sections.

Each of said carriers **f** is comprised by an own frame with heads 20 having hitching means for the respective sections of the holding belt **g** and having the essential feature of providing passages **H - K** for both band sections **II** and **II** along thereof, one at each side of the successive own sections of said belt.

A first passage **H** corresponds to the up stream section **III** of the band loaded with an oil layer en both faces thereof and so that the carrier frame does not exert any dragging over said layers, being this passage limited from one head to the other head **20** by a pair of end rolls **21** surrounding the inner face of the band and an intermediate roll **22** surrounding the outer band face.

The above-mentioned rolls have a channeled surface as illustrated in the drawings which provides sharp ring edges **21' - 22'** that slightly produce flutes in the oil layers at one and the other side of the band and which close themselves when the edges get out and so on along the whole train **F** so that the oil layer arrives practically intact at the well hole despite the fact that the band has been guided step by step: carrier to carrier from said diver head **C** to said separating means **d** that detach both oil layers from one and the other side of the band pouring them into the collecting tray **e**.

The same happens as to the guidance of the oil free down stream section **II**, which moves at the same time as the up stream section **III** along the second passage **K** of the carrier frame, limited in this case by both end rolls 21 that also roll over the inner band face while on the outer band face a shoe 23 slides at the level of the intermediate roll 22 of the other passage, formed by a simple crossbar operating over the band without blocking its free sliding.

The frame of each of said centralizing carriers is comprised by two parallel plates 24 which are joined together by means of crossbars 24' formed as an integral part of said plates, with the mentioned heads 20 connecting the mentioned sections of the holding belt, which connection is established by means of a bolt - pin 25 that passes through an end loop 26 of the belt.

Practically, it has been provided as a way of example to form both plates and their intermediate cross bars from a one melting aluminium piece.

In this way, with a uniform separation between the carriers and the diver head in a twelve and a half meter-belt, a firm and secure retention of both band sections and its diver head is obtained, while keeping the set perfectly centralized with respect to the well and retained against any movement on itself, in conditions that enable to ensure a maximum yield extraction.

As it is easy to understand, the introduction of the centralizing train **F** will be made at the same time as the introduction of the band and its head according to the above-mentioned indications, operating on the belt by means of a spindle or the like which will let it in as the diver head **C** gets down with the gradual introduction of the carriers between their sections according to the current advisable art.

It is to be pointed out that in order to facilitate the mounting of said carriers between both band sections, the roll axis 27 as well as the cross bar shoe 23 are comprised by easily dismountable bolts.

As it appears in Figure 7, which shows a cross section of the carrier schemed within a tubular well wall, it may be seen that any possible contact between the carrier frame and this wall will be established by means of the corner portions of their heads 20 acting as shoes and in no case will the intermediate roll 22, which tends to project out of

the carrier, get in contact with said wall, thus avoiding any stopping action and consequently any oil retention by the latter.

As it becomes easy to understand, the design of the frame of each of said carriers, their rolls and their location will be subject to the own characteristics of the well, particularly as to diameters is concerned.

On the other hand, and always within the scope of this invention, it must be mentioned that in order to ensure the friction between the lifting belt **A** and the motor pulley 9, an alternative has been provided with regard to the already described one and illustrated in figure 2, which is illustrated below in relation with the scheme in Figure 10.

According to this new arrangement, two motor pulleys 9 and 9' are provided together and coupled between each other to the same power plant illustrated in Figure 8 by means of a chain transmission (not illustrated) between the respective axis of both pulleys.

The second pulley 9' replaces roll 8 of the example of figure 2 and on the mentioned higher section 1 of the band that would be extended between both pulleys, an intermediate roll 30 is introduced and mounted with free rotation on the frame in order to increase at a maximum the length of this band section which remains adjusted around both pulleys.

In order to ensure friction even more between said higher section I and the rim of both pulleys, a pair of rolls 31 is included, said rolls being equivalent to the rolls 15 of the previous example, located at the ends of a lever 32 pressed by a spring 33 supported on a buffer 34 provided by the top end frame B on this set, where the guidance and operation of the band from both rolls 1 towards the interior of the well is

kept according to what has already been described and illustrated and as appears in said scheme.